

ON SOME NEW CRETACEOUS (AND EOCENE?) MOLLUSCA OF CALIFORNIA.

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[With Plates xlvii and xlviii.]

- I. *Sistrum* (*Ricinula*?) *cretaceum* n. sp. Plate xlvii, figs. 1 and 2, twice natural size.

Outline obtuse-rhomboid; higher than wide; first whorl nearly flat, smooth, next two turbinate with about 20 nodular strong ribs, crossed by 5 or 6 revolving ribs, the two central strongest, and increasing to about 16 on the fourth or body whorl; lip slightly expanded, with two spinous projections on outer edge formed by the central ribs; inner edge of labrum with three prominent teeth at irregular intervals, and columella with two close together, also one on body-whorl near posterior angle of mouth; some rudimentary teeth also near canal. A young specimen has only four teeth, two on each side of mouth, distributed so as to form the angles of a square; as older ones may develop more, the total dentation is still uncertain. Canal very short, open; spire shorter than mouth. Length 0.75 inch, breadth 0.62; mouth 0.50 long, 0.25 wide.

This seems to be the first-species of *Sistrum* found in North America, and is perhaps of the subgenus *Ricinula*, though this depends on the question as to its being mature. All other species known live on the tropical Pacific islands and in East Indian seas, a few also in the West Indies and Brazil. Four specimens were received through the State Mining Bureau from Morley, Shasta County, with other known cretaceous species. The name *Sistrum* is two years older than *Ricinula*, though used as a subgenus of the latter by Tryon and others. There is much resemblance in this shell to young shells of *Perissolax brevirostris* Gabb, but that has no teeth.

2. *Littorina subobesa* n. sp. Plate xlvii, figs. 3 and 4, twice natural size.

Outline ovate, less round than that of *L. rudis*, approaching that of *L. obesa* of the Pacific islands, without the subangled base; whorls 4 to 5, rounded, polished, with microscopic revolving impressed lines closely arranged; mouth over half of length, semioval, the columellar margin being nearly straight; imperforate. Length 0.60 to 0.70, width 0.40 to 0.45 inch. Morley, Shasta County, colored brown; Marysville Buttes, yellowish; False Bay, San Diego, blackish. These colors, however, may not have been those of the living shells. The first locality is certainly cretaceous A, the others cretaceous B, or Eocene, containing many species of that age. The shells figured are from the first two localities.

Collected for the Mining Bureau by its assistants, and duplicates presented to the California Academy of Sciences. Those from the second place named have a very fresh appearance but were found in a very hard limestone. I formerly supposed them to be a form of *L. compacta* Gabb, but they seem too different and too uniform in their differences to be so called. I referred to them by that name in my catalogue of San Diego Fossils, Bulletin of Mining Bureau, No. 4, 1894, p. 61.

3. *Calliostoma lignitica* n. sp. Plate xlvii, fig. 5, twice natural size.

Outline pyramidal; higher than wide; whorls six, first three turbate, smooth (worn?), fourth with 20 vertical ribs crossed by three strong revolving ribs regularly cancelling the surface and continuing with wider intervals to the body-whorl; upper surface of whorls nearly flat, with a peripheral right angle from which the side of whorl drops vertically; sutures nearly hid by a prominent rib; body-whorl absent from only specimen, but must have

closely resembled the preceding one; height of spire 0.50 inch, breadth 0.50. On the proportionate scale the base of shell must have been about 0.75 inch wide. It much resembled the living *C. gemmulatum* Carp., in form, but differed in sculpture; also differs from the other two species before described from the cretaceous beds of California. Found by W. L. Watts in the head-wall of the San Joaquin coal mine, together with several other species of Cret. A and B.*

4. *Sigaretus costatus* n. sp. Plate xlvii, fig. 6, twice natural size.

Outline oval; whorls about three, the outer enclosing the others, haliotiform; surface covered by about 18 concentric ribs, strong, rounded, and with very narrow intervals between; they appear granulated by intersection of coarse lines of growth. Length 0.45 inch, breadth 0.35, height 0.12.

One specimen from head-wall of San Joaquin Mine. It is filled with asphaltum, coloring it dark brown, and appears similar in form to the *Stomatia intermedia* of San Diego Cret. A (Bulletin iv, 1894, p. 46, pl. 3, fig. 43), but has no other resemblance, and comes nearer "*Sinum planicostum*" Gabb, of the Los Angeles Pliocene, which, however, is identical with the living *Sigaretus debilis* Gould, of Catalina Island to Gulf of California.

5. *Opis triangulata* J. G. Cooper (Stanton). Plate xlvii, figs. 7, 8, 9, the two last twice the natural size.

Corbula triangulata Cooper. State Min. Bur. Bull. iv, 49, pl. 2, fig. 42.

Opis triangulata Cooper. Stanton, Bull. 133, U. S. Geol. Sur., 1896, p. 59.

*The *Potamides carbonicola*, described in Bulletin 4, 1894, p. 44, from the California Coal Mine, near Huron, Fresno County, has lately been received from Cret. B. beds near San Diego, many feet higher than the lignite, but with other fossils of similar age.

In describing this species the large specimen mentioned by Stanton was not seen by me nor recognized as the adult of the small one figured, but a small single valve like the figure was found, which had one tooth like that of a *Corbula*, from which the genus was published, with very much doubt. The description therefore needs amendment to include the large specimen which is fully twice the size of type. Its length is 0.75 inch at base, breadth 0.55, anterior height 0.60. Beak forming an obtuse point; transverse ribs over 35. It does not closely resemble the figures of species of *Opis* given in textbooks, and to show its resemblance to *Corbula* two better figures of the type specimen are here given, with one of the adult valve. In shape this closely resembles Stanton's *O. californica* in his pl. vii, fig. 3.

Triplicosta n. subg.

With the generic characters of *Pholadomya* (as far as known) and similar in sculpture; the shell is not pearly and thin, but dull and chalky; form like that of Agassiz's section *Multicostæ*; the ribs even more numerous, covering the whole surface, and of two forms; the posterior, simple, broad and rounded, cover about half the surface, the anterior, formed by division of the broad ones each into 3 or 4, occupy the rest, all diverging from the beaks, with a slight curve backwards, to end at the base. It thus approaches in richness of sculpture the only living species, that of the West Indies, which has three forms of ribs. While some of Agassiz's sections of the genus are stated to be thicker-shelled than others, and pearliness seems not to be universal, it is possible that chalkiness may be caused by fossilization, as it is not often mentioned in descriptions, especially of the West Coast fossils. Though in most points best agreeing with

Pholadomya it may be proved by better specimens to be allied to *Cardita* or *Petricola*, both having species of similar outline and sculpture, but of course very different otherwise. No sign of their strongly toothed hinge is visible in the specimens yet seen.

6. *Pholadomya* (*Triplicosta*) *progressiva* n. sp. Plate
xlviii, figs. 11 and 12, natural size.

Outline oblong quadrilateral; length varying from nearly twice the height to a little less than height; cardinal area posteriorly well-defined ovate, large; valves gaping moderately behind; umbos moderate, at about $\frac{1}{4}$ th of length from anterior end and a quarter of an inch apart; ribs nodular from irregular lines of growth, the posterior broad ones covering from half to two-thirds of surface, and about 10 in number, then each gradually dividing into 3 or 4 narrow sharp ones; the posterior 15 to 18, covering the rest of surface, with intervals equal in width to ribs. The shell seems to have been about one-eighth of an inch thick, and the inside had corresponding rib-like markings. Length of largest 2.75 inch, height 2.50, breadth 2.00.

Found by W. L. Watts, along Santa Paula and Sespi Creeks, branches of the Santa Clara River, Ventura Co., and by another collector near San Luis Rey, San Diego Co., associated with *Cardita planicosta* and other Cret. B (or Eocene) fossils. Four specimens are from the former and three from latter locality. They vary considerably in outline from both counties, from pressure.

All the 200 or more species of *Pholadomya* described seem very variable, and many of them should probably be called varieties, as a study of about half the figures published indicates. None of them, however, has the triplicate ribs of this species.

In reviewing the West Coast species some corrections

are found necessary, which I will insert here. The first described was *P. subelongata* Meek, from Vancouver Island cretaceous, in the Transactions of the Albany Institute, vol. iv, p. 42, 1857, and repeated, with a figure, in Bulletin of Hayden's Geog. & Geol. Survey of the Territories, vol. ii, 1896, p. 362, pl. 2. Meek gives the number of ribs as 16 to 25, a wider range of variation than I find admitted in any other species, but whether caused by variation or imperfection of specimens is uncertain. At any rate, the figure shows that it is identical with that described by Gabb as *P. breweri* in the Pal. of Cal., i, p. 152, pl. 22, fig. 123. Gabb was misled by too hasty reference to Meek's first description, for he states that "the marked difference in the number of ribs will at once distinguish them, *P. subelongata* having but 16 ribs." Gabb's second species, *P. nasuta*, may account for Meek's 16-ribbed form, as Gabb gives its range from 12 to 16.

Whiteaves considers both as identical with Orbigny's *P. royana* of France, and states that Orbigny figures the extremes of variation in ribs as from 10½ to 29, which may arise from imperfection in the specimens.

Five specimens from Pt. Loma, San Diego, called *P. breweri* by me in Bull. iv, State Mining Bureau, 1894, are like it in form, but one has the high beaks of *nasuta*, and all have fewer ribs than typical *subelongata*, but have lost all shell, and being internal casts, cannot form certain proof as to the number of ribs once on the outside. The same is probably true of Gabb's *P. oregonensis*. The nearest resemblance to *P. progressiva* is in *P. occidentalis* Morton, from the Cretaceous of N. J. southward, which has 25 to 30 ribs, but none of them triplicately divaricate. But one Eocene species is recorded in the East, *P. marylandica* Con., of which no figure is accessible here.

7. *Cardita alticosta* Gabb. Plate xlvi, fig. 10, natural size.

? *Cardita alticosta* Gabb, Pal. of Cal. ii, 268, pl. xxxvi, fig. 16.

The type of this species was from near Arivechi, State of Sonora, Mex. Mr. Watts has found apparently the same species, not rare, in the Cret. B or Eocene beds, along the Sespi branch of the Santa Clara River, Ventura County and I have had one figured for comparison. It is found associated with *C. planicosta* (*C. horni* Gabb), and others of that group of fossils. None of them are perfect enough to show the hinge, but in form and sculpture they seem the same. Three or four others of the Arivechi species have also been found in southern California since they were described.